

## CLAIMS

What is claimed is:

1. A gas processing plant comprising an absorber in which liquid carbon dioxide that is produced from carbon dioxide contained in a feed gas absorbs carbonyl sulfide that is produced from hydrogen sulfide contained in the feed gas.
2. The plant of claim 1 wherein the carbonyl sulfide is formed from the hydrogen sulfide in a dryer, and wherein the dryer is coupled fluidly and upstream to the absorber.
3. The plant of claim 1 wherein the feed gas comprises a syngas, and wherein the syngas is provided by a shift converter that is coupled fluidly and upstream to the absorber.
4. The plant of claim 1 further comprising a separator coupled fluidly and downstream to the absorber, wherein the separator is configured to separate the carbonyl sulfide from the liquid carbon dioxide.
5. The plant of claim 1 wherein the liquid carbon dioxide is provided by an autorefrigeration unit that is fluidly and downstream coupled to the absorber.
6. The plant of claim 5 wherein the autorefrigeration unit further produces a hydrogen containing gas that is optionally provided to a combustion turbine.
7. The plant of claim 6 further comprising a pressure swing adsorption unit that is fluidly coupled to the autorefrigeration unit and receives at least part of the hydrogen containing gas.
8. The plant of claim 7 further comprising a second autorefrigeration unit that receives an offgas from the pressure swing adsorption unit.
9. A plant comprising:  
  
a dryer comprising a desiccant and configured to receive a feed gas comprising hydrogen sulfide and carbon dioxide, wherein the desiccant has sufficient water affinity to convert at least part of the hydrogen sulfide to carbonyl sulfide;

a source of liquid carbon dioxide fluidly coupled to an absorber and configured to provide liquid carbon dioxide to the absorber;

wherein the absorber is further fluidly coupled to the dryer and configured to receive the carbonyl sulfide and carbon dioxide such that the liquid carbon dioxide in the absorber absorbs at least part of the carbonyl sulfide.

10. The plant of claim 9 further comprising a separator coupled fluidly and downstream to the absorber, wherein the separator is configured to separate the carbonyl sulfide from the liquid carbon dioxide.
11. The plant of claim 9 wherein the source of liquid carbon dioxide comprises an autorefrigeration unit.
12. The plant of claim 11 wherein the autorefrigeration unit further produces a hydrogen containing gas that is optionally provided to a combustion turbine.
13. The plant of claim 12 further comprising a pressure swing adsorption unit that is fluidly coupled to the autorefrigeration unit and receives at least part of the hydrogen containing gas.
14. The plant of claim 13 further comprising a second autorefrigeration unit that receives an offgas from the pressure swing adsorption unit.
15. A plant comprising:

a membrane separator that receives a sulfur-depleted syngas and separates hydrogen from a carbon dioxide-containing reject gas;

an autorefrigeration unit fluidly coupled to the membrane separator and receiving the carbon dioxide-containing reject gas, wherein the autorefrigeration unit produces a carbon dioxide product and a hydrogen-containing offgas; and

a combustion turbine that receives the hydrogen and hydrogen-containing offgas.
16. The plant of claim 15 wherein a solvent-based sulfur removal unit produces the sulfur-depleted syngas from a shifted syngas.

17. The plant of claim 16 further comprising a compressor operationally coupled to an expander, wherein the compressor compresses the hydrogen and wherein the expander expands the carbon dioxide-containing reject gas.
18. The plant of claim 16 further comprising a pressure swing adsorption unit that receives at least part of the hydrogen.
19. The plant of claim 16 further comprising a dryer that dries the carbon dioxide-containing reject gas before the carbon dioxide-containing reject gas enters the autorefrigeration unit.
20. The plant of claim 16 wherein the combustion turbine is thermally coupled to a steam turbine.
21. A gas processing plant comprising an absorber in which liquid carbon dioxide that is produced from carbon dioxide contained in a feed gas absorbs carbonyl sulfide that is contained in the feed gas.